HMC199MS8

DUAL SPDT SWITCH DC - 2.5 GHz

Typical Applications

The HMC199MS8 is ideal for:

- Cellular
- ISM Basestations
- PCS

Features

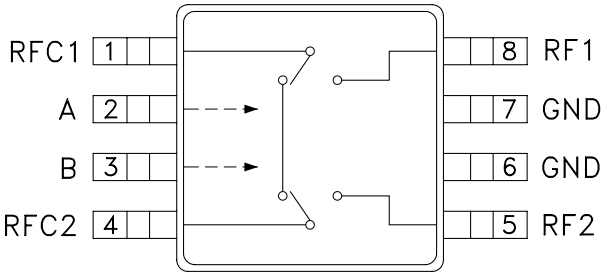
Integrated Dual SPDTs

Low Insertion Loss: <0.5 dB @ 2.0 GHz

Positive Control: 0/+5V

Ultra Small MSOP8 Package: 14.8 mm^2

Functional Diagram



General Description

The HMC199MS8 is a low-cost dual SPDT GaAs "bypass" switch in an 8-lead MSOP package covering DC to 2.5 GHz. This four RF port component integrates two SPDT switches and a through line onto a single IC. The design provides low insertion loss of less than 0.5 dB while switching passive or active external circuit components in and out of the signal path. Port to port isolations are typically 25 to 30 dB. On-chip circuitry enables positive voltage control operation at very low DC currents with control inputs compatible with CMOS and most TTL logic families. Applications include LNA or filter bypass switching and single bit attenuator switching.

Electrical Specifications, T_A = +25° C, Vctl = 0/+5 Vdc, 50 Ohm System

Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 1.0 GHz DC - 2.0 GHz DC - 2.5 GHz		0.3 0.5 0.7	0.6 0.8 1.0	dB dB dB
Isolation	DC - 2.0 GHz DC - 2.5 GHz	22 17	25 21		dB dB
Return Loss (On State, Any Port)	DC - 2.0 GHz DC - 2.5 GHz	17 12	20 15		dB dB
Input Power for 1 dB Compression	0.5 - 2.0 GHz	19	23		dBm
Input Third Order Intercept (Two-tone Input Power = 0 dBm Each Tone)	0.5 - 2.0 GHz	32	36		dBm
Switching Characteristics tRISE, tFALL (10/90% RF) tON, tOFF (50% CTL to 10/90% RF)	DC - 2.5 GHz		 20 40		 ns ns

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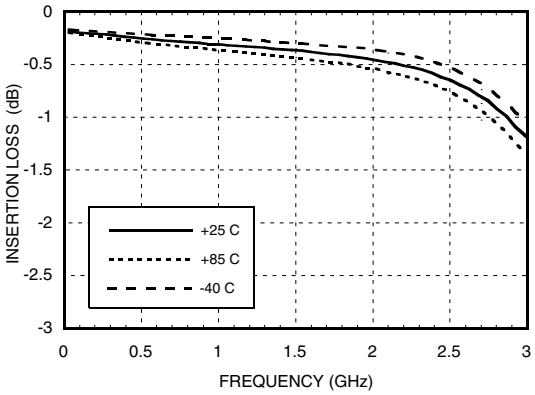
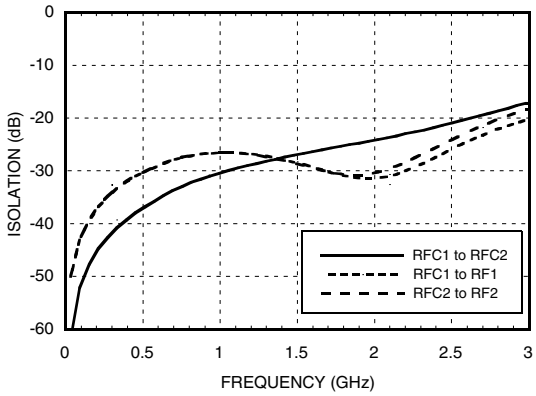
Insertion Loss

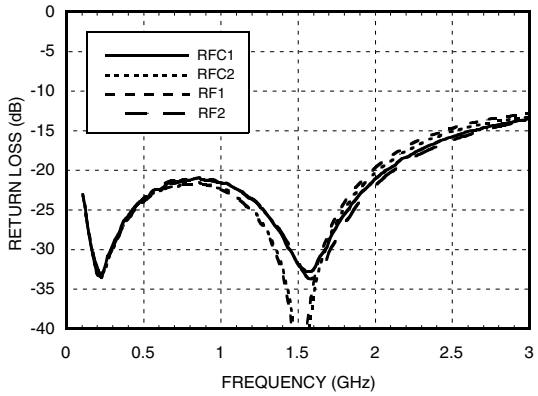


Isolation



Note: Isolation between RF1 - RF2 (when RFC1 - RFC2 is in insertion loss state) is 25 dB @ 1 GHz and 17 dB @ 2 GHz.

Return Loss



Compression vs. Frequency

	Carrier at 900MHz		Carrier at 1900MHz	
CTL Input	Input Power for 0.1 dB Compression	Input Power for 1.0 dB Compression	Input Power for 0.1 dB Compression	Input Power for 1.0 dB Compression
(Vdc)	(dBm)	(dBm)	(dBm)	(dBm)
+5	20	23.5	19	22

Caution: Do not operate continuously at RF power input greater than 1 dB compression and do not "hot switch" power levels greater than +13 dBm (Control = 0/+5Vdc).

Distortion vs Frequency

Control Input	Input Third Order Intercept (dBm) 0 dBm Each Tone	
(Vdc)	900 MHz	1900 MHz
+5	34.5	37.5

Truth Table

**Control Input Tolerances are +/- 0.5 Vdc*

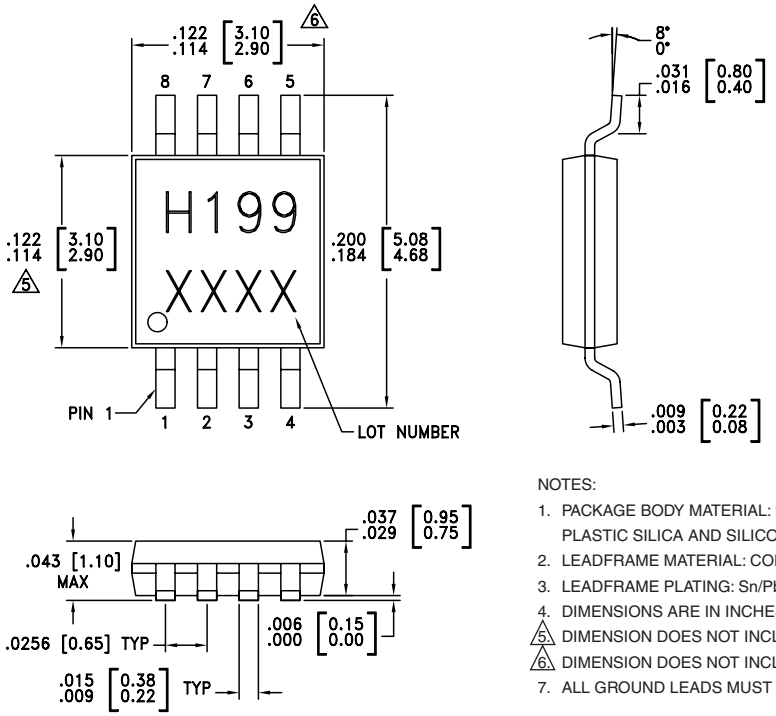
Control Input*		Control Current (Typical)		Signal Path		
A (Vdc)	B (Vdc)	Ia (uA)	Ib (uA)	RFC1 to RFC2	RFC1 to RF1	RFC2 to RF2
0	+5	-65	65	ON	OFF	OFF
+5	0	65	-65	OFF	ON	ON

DC blocking capacitors are required at ports RFC1, RFC2, RF1, RF2. Choose value for lowest frequency of operation.

Absolute Maximum Ratings

RF Input Power V_{CTL} = 0/+5V	+24 dBm
Control Voltage Range (A & B)	-0.5 to +7.5 Vdc
Channel Temperature	150 °C
Thermal Resistance	172 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

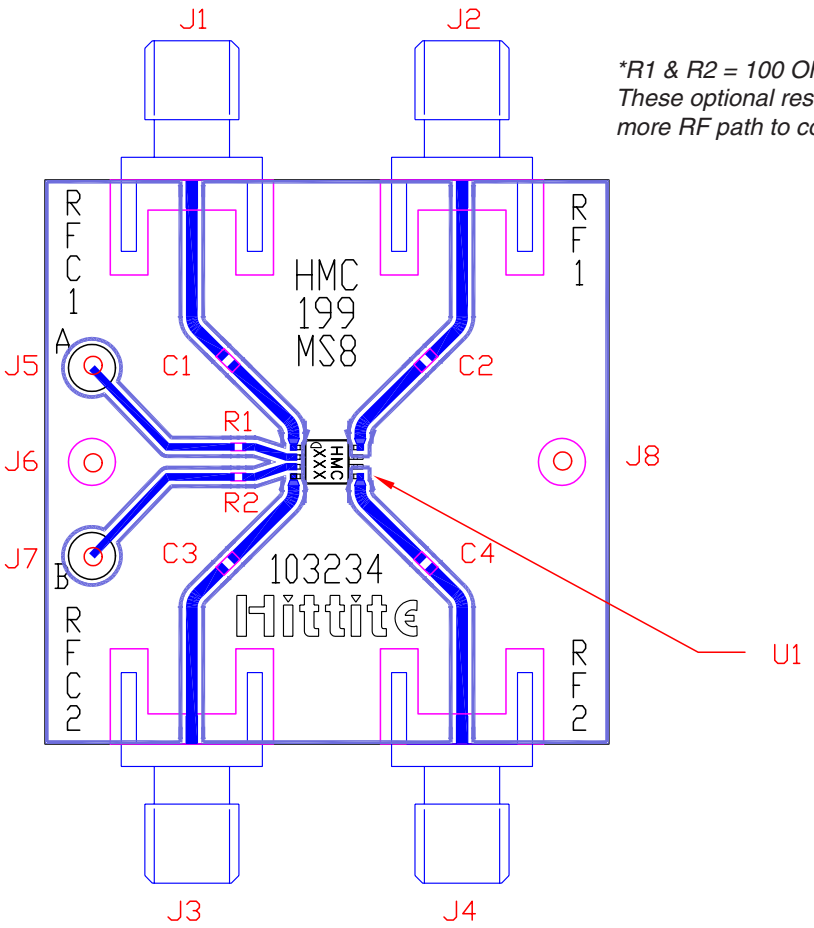
Outline Drawing



NOTES:

1. PACKAGE BODY MATERIAL: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEADFRAME MATERIAL: COPPER ALLOY
3. LEADFRAME PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.15mm PER SIDE.
6. DIMENSION DOES NOT INCLUDE MOLDFLASH OF 0.25mm PER SIDE.
7. ALL GROUND LEADS MUST BE SOLDERED TO PCB RF GROUND.

Eval Board Layout (Top View)



*R1 & R2 = 100 Ohm.
These optional resistors will provide more RF path to control circuit isolation.

The circuit board used in the final application should be generated with proper RF circuit design techniques. Signal lines at the RF ports should have 50 ohm impedance. The evaluation circuit board shown above is available from Hittite Microwave Corporation upon request.

List of Material

Item	Description
J1 - J4	PC Mount SMA RF Connector
J5 - J8	DC Pin
C1 - C4	Chip Capacitor, 0402 Pkg. Choose value for lowest frequency of operation. 330 pF is provided on PCB.
R1 - R2	100 Ohm Resistor, 0402 Pkg.
U1	HMC199MS8 Bypass Switch
PCB*	103234 Evaluation PCB 1.5" x 1.5"
* Circuit Board Material: Rogers 4350	

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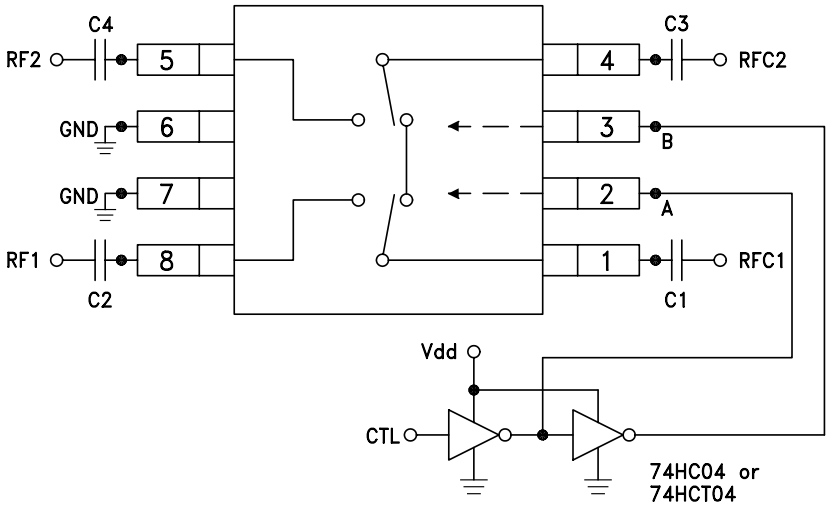
Typical Application Circuit



Notes:

1. Set A/B control to 0/+5V, Vdd = +5V and use HCT series logic to provide a TTL driver interface.
2. Control inputs A/B can be driven directly with CMOS logic (HC) with Vdd = 5 to 7 Volts applied to the CMOS logic gates.
3. DC Blocking capacitors are required for each RF port as shown. Capacitor value determines lowest frequency of operation.
4. Highest RF signal power capability is achieved with Vdd = +7V and A/B set to 0/+7V.